A

Synopsis of Thesis Entitled

"Groundwater Quality Status Using Spatial Analysis of Degloor Tahsil, Maharashtra"

To be submitted to

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

By

Mr. PATIL SACHIN RAMRAO

Research Student
N. S. B. College Nanded,
Swami Ramanand Teerth Marathwada University, Nanded

Under the guidance of

Dr. PATWARI JAYPRAKASH MANOHARRAO

Research Guide in Environmental Science,

Maharashtra Udayagiri Mahavidayalaya Udgir, Latur

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

August, 2017

INTRODUCTION:

Water is the chemical substance essential for life on Earth. Life as we know it could not have possibly existed on Earth without water. Water is one of only a handful of substances which are less dense as solids than liquids. The attempt of study is to understand the groundwater quality of Deglur. Water is capable of dissolving a variety of different substances. In fact, water is commonly referred to as the 'universal solvent' because it dissolves more substances than any other known liquid. One of the major problems nowadays there is change in physical, chemical and biological characteristics of potable water due to anthropogenic activity. Water is unique for it is the only common substance found naturally in all three common states of matter: physical states are as liquid, solid and gas at the temperatures normally found on Earth. Pure water (which never really found in nature) is essentially clear in colour (Wetzel, 2001).

Our kidneys and water's solvent properties keep us alive and healthy. The kidneys are responsible for filtering out substances that enter our bodies from the food and drink we consume. But, the kidneys have got to get rid of these substances after they accumulate them. This is where water is helpful; water being such a great solvent dissolves these substances, washes through the kidneys and sends them out of our bodies.

The need for water varies with culture, geography, type of community and season. The availability of water varies with geography and with the provisions made to supply a constant source of water. Geographic location affects both the quantity and distribution of rainfall.

In areas blessed with abundant rainfall throughout the year, there is rarely a worry about the need for water; instead, the concern is with the time intervals between and intensity of storms.

When the growing season is dry crops and lawns must be watered intensively. During the hot summer months, water use in arid areas may exceed 2.3 m^3/ capita /day, compared to a normal demand of 0.4 m^3/ capita /day, because of the need to water lawns and shrubs. Larger pipes, pumps, wells, treatment facilities and reservoirs are required in arid areas, thus greatly increasing the cost of water supply. The need for water and the

long dry periods between rainfall events provided the impetus for the development of the large water resource management projects in various areas.

Population explosion, agricultural practices, urbanization and industrialization have made water pollution a severe problem and have decreased the availability of drinking water. Many parts of the world face such a scarcity of water. Most of wastewaters are discharged into rivers, lakes and estuaries without any treatment. People must learn better utilization of available water to achieve human health, industrial growth and food security.

Water and Future Problems:

India is facing a perfect storm in managing water. Centuries of mismanagement, political and institutional incompetence, and indifference at central, state and municipal levels, a steadily increasing population that will reach an estimated 1.7 billion by 2050, and a rapidly mushrooming middle class demanding an increasingly protein-rich diet that requires significantly more water to produce together, these are leading the country towards disaster. On top of that, there is an absence of serious and sustained attempts at the central or state levels to manage water quantity and quality, a lack of implementation of existing laws and regulations, and pervasive corruption and poor adoption rates of new and cost-effective technologies.

India is now facing a water situation that is significantly worse than any that previous generations have had to face. All Indian water bodies within and near population centers are now grossly polluted with organic and hazardous pollutants. Interstate disputes over river waters are becoming increasingly intense and widespread. Not a single Indian city can provide clean water that can be consumed from the tap on a 24×7 basis. Surface water conditions are bad. However, the groundwater situation is even worse.

Groundwater extraction is growing and has become increasingly unsustainable. Consequently, in many parts of the country, groundwater levels are declining steadily. In some parts, the levels are declining by more than one meter per year. A lack of proper wastewater treatment from domestic, industrial, and mining sources has meant that groundwater is being progressively contaminated by known and unknown pollutants, increasing the potential health risks to humans and ecosystems.

Most people are under the false impression that there is supply of water readily available for their every need and that the water reserves are abundant. The world is faced with mounting pressure on water resources due to, growing demand; irregular distribution of freshwater and increased pollution of existing water supplies.

The total amount of water on earth remains roughly the same through the years and is simply displaced from one place to another through the hydrological cycle. Man can't increase the amount of water on his own and therefore, it is clear that great problems can arise due to demands and the pollution of natural freshwater sources due to increase of population.

Water pollution is one of the main unpleasant situations of the modern world. It is a cosmopolitan problem which needs urgent attention and prevention. On the one side we need to conserve and manage nature's resources, but on the other also keep the need for further industrial growth in mind. This has resulted in the need for more information regarding the biological effects of water pollutants.

According to official assessments by the Indian ministry of water resources, in 2004, around 29% of the groundwater blocks were critical, semi-critical or overexploited. It also concluded that the situation was deteriorating rapidly. In 2014, the central groundwater board noted that the number of over-exploited districts increased from 3% in 1995 to 15% in 2011.

The Central Ground Water Authority (CGWA) has notified 82 areas (Districts, Blocks, Mandals, Talukas, and Municipalities) for regulation of ground water development. In these areas, installation of new ground water abstraction structures is not permitted without prior specific approval of the Authority and Authorized officer. Moreover, proposals for setting up/expansion of ground water based industries including bottled water manufacturing units are forwarded by State Pollution Control Boards and Bureau of Indian Standards to CGWA for seeking No Objection Certificate (NOC) for ground water withdrawal. NOC is not accorded to such industries including bottled water manufacturing units proposed to be located in areas notified by the Authority. In non-notified areas, NOC is issued with mandatory pre-conditions of adoption of rain water harvesting system, monitoring of ground water abstraction as well as monitoring of

ground water level and quality etc. by the industry. For enforcement of the regulatory directions issued under Section 5 of Environment (Protection) Act, 1986, concerned Deputy Commissioners/District Collectors have been authorized to take necessary action in case of violations of directives of CGWA in the notified areas.

Irrigation in India includes a network of major and minor canals from Indian rivers groundwater well based systems, tanks, and other rainwater harvesting projects for agricultural activities. Of this groundwater system is the largest. In 2010, only about 35% of total agricultural land in India was reliably irrigated. About 2/3rd cultivated land in India is dependent on monsoons. Irrigation in India helps improve food security, reduce dependence on monsoons, improve agricultural productivity and create rural job opportunities. Dams used for irrigation projects help produce electricity and transport facilities, as well as provide drinking water supplies to a growing population, control floods and prevent droughts (Siebert, 2010).

STUDY AREA:

Deglur is a town and a municipal council in Nanded district in the state of Maharashtra, India. It is often written as Degloor in the local area, and is the largest tahsil of Nanded. The Degloor region is known for its socio-cultural history.

Degloor is situated near the point where Telangana, Maharashtra and Karnataka boundaries meet. The Telangana - Maharashtra state boundary is merely one and half a kilometer away from the town center and Karnataka state boundary is around 20kms. The town is situated on the banks of the river Lendi. Degloor has been well known (Gokul Nagar Degloor) Ullewar Community as well as a marketplace since ancient years. The main occupation of most of the population here is agriculture (Farming) in which they mostly grow sugarcane, cotton, grains, and bananas. It is known for its cloth market, gold jewellery, and agricultural products. Nearby places are the villages; Taakli on North (Degloor - Nanded State Highway), Kawalgaon on West-South (Degloor - Udgir state highway 168) and Mirzapur on East-South (Degloor - Madnoor state highway 104).

As of 2011 India census Degloor tahsil has a population of 173,369. Males constitute 51% of the population and females constitute 49%. Degloor has an average literacy rate of 64%, higher than the national average of 59.5%. The male literacy rate is

73% and female literacy rate is 55%. In Degloor, 14% of the population is under 6 years of age. In the city Marathi, Urdu, Telugu, and Kannada are commonly spoken.

Salient Features of Degloor:

Study area	*Degloor Tahsil*
Taluka	*Degloor*
District	*Nanded*
State	*Maharashtra*
Area	*682.80 Sq. Kilometer*
Population	*173,369*
Coordinates	*Latitude : 18.5458672 N* *Longitude : 77.5762703 E*

Source: Maps of India.Com, Census of India 2011.

Figure: Google image showing the study area of Degloor.

OBJECTIVES:

- Determination of groundwater quality parameters of Degloor Tahsil
- To study the scope for agriculture use
- Spatial analysis of groundwater by using GIS
- To determine the potability of water

METHEDOLOGY:

The water samples from Degloor Tahsil will be collected from different selected sites in the precleaned polythene bottles. Some soil samples will be collected from different selected sites from irrigation land. After collection of samples from different sites physical parameters will be analyzed on sampling site and chemical parameters will be immediately analyzed in laboratory.

Water Analysis:

1) Temperature (Micro-thermometer ^{o}C)**:**

Temperature measurements are usually made with mercury filled centigrade thermometer. The reading should made by dipping the thermometer in the sample (Water or Waste water). The measurement of temperature in water is important basically for its effects on the chemistry and biochemical reaction in the organisms. It is also important in the determination of pH, conductivity and saturation level of gases in water. The temperature is best determined by the use of mercury thermometer or digital thermometer up to the desired accuracy in ^{o}C**.**

2) pH (Potential Hydrogen):

pH is a term used universally to express the intensity of the acid or alkaline condition of a solution. It is a measure of hydrogen ion concentration or more precisely the hydrogen ion activity. pH is defined as the logarithm (base 10) of the reciprocal of the hydrogen ion concentration. pH can be measured by ph digital meter or ph paper.

3) Electrical Conductivity:

The main feature of most conductivity meters is a conductivity cell containing electrodes of platinum coated with Pt black or carbon. These electrodes are mounted rigidly and placed parallel at a fixed distance. Most conductivity meters work on the principal of Wheatstone bridge in which the cell forms an arm of the bridge. Electrical conductivity can be measured by using conductivity meter in μmh/cm.

4) Total Solids:

Total dissolved solids denote mainly the various kinds of minerals present in water. TDS and SS do not contain any gas and colloids. These can be determined as the residue left after evaporation of the unfiltered samples. Total dissolved solids and suspended solids are determined as the residue and filtrate left after evaporation of the filtered sample and measured in mg/L.

5) Total Hardness (EDTA Method)**:**

Hardness is the property of water which prevents the lather formation with soap and increase the boiling point of waters. The major cations imparting hardness are calcium and magnesium. The anions responsible for hardness are bicarbonates, carbonate, sulphate and chlorides. Hardness is temporary if it is associated mainly with carbonates and bicarbonates and permanent if with sulphates and chlorides. It is calculated in terms of mg/L.

6) Calcium (Titrimetric Method):

The presence of calcium in water is mainly due to its passage through or over deposits of limestone, dolomite, gypsum and other gypsiferous materials. Calcium is one of the most abundant elements found in natural water. It is an important ion in imparting the hardness to the water. Calcium and magnesium are two major scale forming constituents in most raw water supplies. Calcium is usually determined on potable and industrial waters only but not on sewage. Among the methods available for the determination of calcium is EDTA titrimetric method and gravimetric method are more accurate. It is calculated in terms of mg/L.

7) Magnesium (Titrometric Method):

Magnesium salts occurs in significant concentration in natural waters. Sea waters and estuary waters contain high amounts of magnesium (1400 ppm). The Magnesium also occurs in all kinds of natural water, but its concentration remains generally lower than the calcium. Like calcium, it is also one of the important cation imparting hardness to the water. The determination of magnesium is usually required only for raw and potable waters and not for polluted waters and other waste waters. It is calculated in terms of mg/L.

8) Sodium (Flame Photometer):

Sodium is present in most natural waters from negligible to appreciable concentrations. It is of importance when salinity or total dissolved solids are a consider in the use of water. It can be determined either gravimetrically or by using a flame photometer. Sodium is best determined by flame photometric method. It is calculated in terms of mg/L.

9) Potassium (Flame photometer):

Like Sodium, potassium is also a natural occurring element however the concentration remains quite lower than the sodium, calcium and magnesium. It has got a more or less similar chemistry like sodium and remains mostly in solution without undergoing any precipitation. Potassium is best determined by flame photometric method. It is calculated in terms of mg/L.

10) Total Alkalinity (Titration Method)**:**

Alkalinity is the quantitative capacity aqueous media to react with hydrogen ions. The alkalinity of natural or treated waters is normally due to presence of bicarbonates, carbonate and hydroxide compounds of calcium, magnesium, sodium and potassium. Phenolphthalein and methyl orange are the indicators commonly used for alkaline titrations. It is calculated in terms of mg/L.

11) Chloride (Titration Method)**:**

Chlorides occur naturally in all types of waters. In natural fresh waters however its concentration remains quite low. The most important sources of chlorides in natural waters is the discharge of sewage. In very high concentration it gives a salty taste to the water. It is calculated in terms of mg/L.

12) Nitrate (Spectrophotometer):

Nitrate occurs generally in trace quantities in potable waters. High concentrations of nitrates in ground waters are not uncommon. Domestic sewage, natural runoff and agricultural wastes are the important source of it. The determination of nitrate in drinking water is of prime importance because of the diseases caused by its excessive presence. Nitrate is best determined by using spectrophotometer under wavelength 410 nm.

13) Sulphate (Spectrophotometer):

Sulphates occur naturally in water as result of leaching from gypsum and other common minerals. It naturally occurring anion found almost in kinds of water bodies. It may undergo transformation to sulphur or hydrogen sulphide depending largely upon the redox potential of the water. This is also an important anion imparting hardness to water. Sulphate is best determined by using spectrophotometer under wavelength 420 nm.

14) DO: (Winkler's method):

The presence of dissolved oxygen is essential to maintain the higher forms of biological life and to keep the proper balance of various populations thus making the water body healthy. The chemical and biological processes undergoing in water body are largely dependent upon the presence of oxygen. It is estimated by Winkler's method in mg/L.

Soil Analysis:

1) pH:

pH of soil suspension highly depends on the soil water ratios. Determination of pH at moisture saturation level and 1:5 soil suspension is most common. pH of soil is the measure of hydrogen ion activity and depends largely on the relative amounts of the adsorbed hydrogen and metallic ions.

2) Calcium:

The source of calcium in soil is mainly due to deposits of limestone, dolomite, gypsum and other gypsiferous materials. Calcium and magnesium are two major scale forming constituents in most soils. Among the methods available for the determination of calcium is EDTA titrimetric method and gravimetric method are more accurate. It is calculated in terms of mg/100g.

3) Nitrate - Nitrogen:

Nitrogen in the soil is present mainly in the organic form together with small quantities of ammonium and nitrate forms. The most common method of finding out

nitrogen in soil is Kjeldahl method or which measures only organic and ammonium forms excluding nitrate.

4) Phosphorus:

Phosphorus in soil is generally determined as available phosphorus, which can be extracted from soil with 0.002 N H_2SO_4 (1 Soil: 200 H2SO4). It is always advisable to measure P in fresh soils, however if the soils are to be preserved air dry them instead of oven drying to minimize the error. It is measured by using 690nm wavelength on UV spectrophotometer.

5) Potassium (Flame photometer):

Exchangeable potassium can also be determined in ammonium acetate leachate by flame photometric method. Like Sodium, potassium is also a natural occurring element however the concentration remains quite lower than the sodium, calcium and magnesium. It has got a more or less similar chemistry like sodium and remains mostly in solution without undergoing any precipitation. Potassium is best determined by flame photometric method. It is calculated in terms of mg/100 g.

WORK PLAN:

FIELD WORK	TO ASSESS WATER QUALITY PARAMETERS
START OF Ph.D WORK	AFTER RRC
WORK PERIOD	THREE YEARS
FORM OF STUDIES	FULL TIME

Structure of Research Work:

TIME (MONTH)	WORK
00-06	REVIEW OF LITRATURE AND PROCEDURE PREPRATION
06-30	ANALYSIS OF WATER AND SOIL SAMPLES
30-36	DATA COLLECTION INTERPRETATION, WRITING OF THESIS AND SUBMISSION

REFRENCES:

1) APHA (1985), Standard methods for the estimation of water and waste water, Washington D.C., pp.6-187.

2) BIS (1991). Drinking water specifications IS: 10500. Bureau of Indian standards, New Delhi.

3) G.R.Chhatwal, M.C Mehra, T. Katyal, M.Satake, M. katyal, T. Nagahiro, (1989), Environmental analysis, Amol Publication, New Delhi.

4) http://censusindia.gov.in/AboutUs/OurNetwork/Regional_Offices/maharash.html.

5) Manual of Environmental pollution analysis.

6) Maps of India.Com.

7) P.D. Sharma, (2005), Environmental Microbiology, Narosa Publishing House, New Delhi.

8) S.C. Rangawala, (1998), water supply and sanitary engineering, Chartor Publication. Meerut.

9) Sustainable Environmental Sanitation and Water Services.

10) S.C. Santra, (2005), Environmental Science, New central Book Agency ltd, Kolkata.

11) S. Siebert et al (2010), Groundwater use for irrigation a global inventory, Hydrol. Earth Syst. Sci., 14, pp. 1863–1880.

12) Trivedi, R.K. and Goel, P.K. (1986), Chemical and biological methods for waste pollution studies, Environmental publication, Karad.

13) WWW.googleearth.com.

14) World Health Organization (WHO) (2002). Guideline for Drinking Water Quality, 2nd Ed, Health Criteria and other supporting information (pp.940-949) Geneva: World Health Organization.

15) Wetzel Robert G., (2001), Limnology (Lake and river ecosystems), Academic Press, USA, 3 rd edition, 291-294.

16) Census of India 2001: Data from the 2001 Census, including cities, villages and towns (Provisional). Census Commission of India Archived from the original on 2004-06-16. Retrieved 2008-11-01.

Research Student
PATIL SACHIN RANRAO
N. S. B. College Nanded
S. R.T. M. University, Nanded.

Dr. Patwari Jayprakash Manoharrao
Assistant Professor and Research Guide
in Environmental Science

Maharashtra Udayagiri Mahavidayalaya
Udgir, Latur